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Review Article

A Review on Some Selected Endemic and Threatened Plants of Odisha

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Abstract

The coastal state of Odisha is blessed with rich biodiversity and possesses unique ecosystem. However, due to various factors like over exploitation of plants for medicinal and varied purposes, changing climatic conditions, anthropogenic activities and edaphic factors have caused a decline in the plant diversity. According to International Union for Conservation of Nature Red List of Threatened Species also known as Red Data Book provides an inventory of global conservation status and extinction risk of biological species. In this review an attempt has been made to enumerate some of the selected rare, endemic and threatened plant species of Odisha. Further, the ethno-botanical significance of the chosen plant species have been discussed along with their distribution and present conservation status.

Keywords: *Odisha, rare, endemic, threatened, IUCN*

Introduction

Odisha the land of almighty Lord Jagannath beholding tagline of India's best kept secret is the 8th largest state in the Indian subcontinent. It lies to the eastern side of peninsular plateaus and shares wave kissed border with Bay of Bengal. More precisely it marks its existence between the latitudes 17.780 N and 22.730 N and between longitudes 81.37 E and 87.53 E (Panda & Padhy, 2008). Due to the existence of diverse physiographic regions like Coastal and flood Plains, Middle mountainous and highlands region, Central plateaus, Western rolling uplands and Mangroves spanning across the state, it is full of richness in biodiversity providing shelter to variety spectrum of flora and fauna. (Sahu *et al.*, 2017) Odisha is home to numerous plants which poses momentous medicinal, ethnobotanical and ecological significance. Due to the rapid multi-fold increase in anthropogenic activities and frequent changes in climate and depleting status of forest cover we are on the verge of losing variety of plants across the globe.

The IUCN stands as the most extensive and varied international coalition focused on environmental conservation. Established in 1948, IUCN functions as a democratic entity comprising over 1,300

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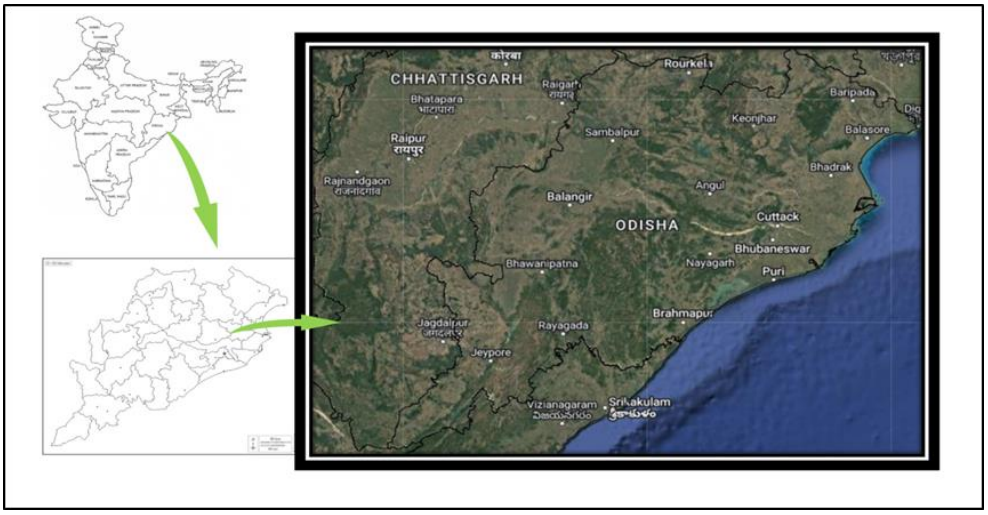

Figure 1 : Geographical Map of Odisha (Indigeo Imaps)

Member organizations alongside 10,000 specialists collaborating to safeguard and preserve the natural environment. The IUCN Red List of Threatened Species contains an elaborative catalogue that enumerates the conservation status of different species across the globe. Instituted in 1964, the Red List delivers essential insights regarding the extinction risks confronted by species, thereby assisting in the formulation of conservation initiatives and policy frameworks (Hoffmann *et al.*, . 2008)

IUCN Red List categories:

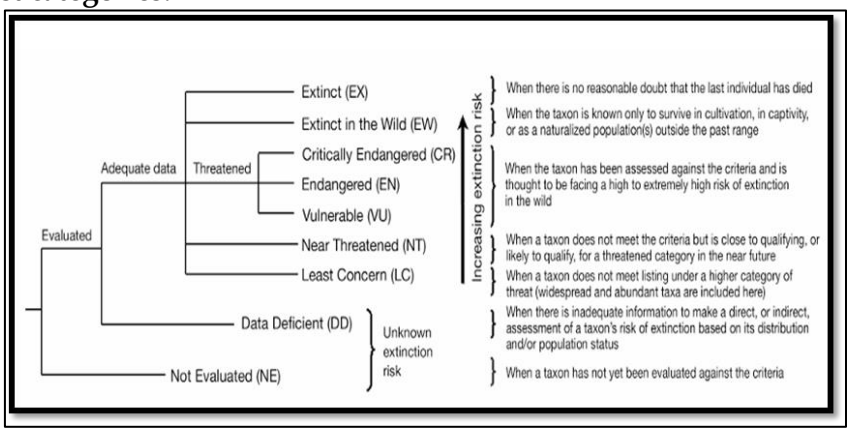

Figure 2: IUCN Red List Categories (IUCN)

The IUCN Red List categorizes species into several key statuses based on their risk of extinction:

(1) Data Deficient (DD): When there is no adequate data present to make a direct or indirect assessment of its risk of extinction based on its distribution ad population status.

(2) Least Concerned (LC): Species that are widespread and abundant. Doesn't qualify for any of the below mentioned criteria

(3) Near Threatened (NT): Species that may become threatened in the near future. A taxon is near threatened when it has been evaluated against CR, EN, VU now. but is close to qualify for is likely to qualify in near future

(4) Vulnerable (VU): Species facing a high risk of extinction in the wild.> 30% decline / 10 years or 3 generations based on below mentioned (a) to (e).

(5) Endangered (EN): Species facing a very high risk of extinction in the wild. >

50 % decline in 10 years or 3 generations based on below mentioned (a) to (e).

(6) Critically Endangered (CR): Species facing an extremely high risk of extinction in the wild. (a) A taxon which population reduction is observed, estimated. > 80% decline over 10 years or three generation on any one direction observation. (b) Decline in hundred (c) An index of abundance appropriate for the taxon. (d) Levels of exploitation (e) invasive introduced species hybridization pathogen pollutants and parasites

(7) Extinct in the Wild (EW): Species that no longer exist in their natural habitat but may survive in captivity. It is known only to survive in cultivation as a naturalized population outside the past range.

(8) Extinct (EX): Species that no longer exist anywhere. A taxon is extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed extinct when exhaustive surveys in known or expected habitat at appropriate times and throughout its historic range have failed to record an individual.

Methodology

This review article aspires to provide a thorough overview of the endemic and threatened plants of Odisha. A systematic literature review was conducted to broaden the existing knowledge on the subject. With a wide-ranging search of electronic databases, academic journals, and books were conducted to identify relevant literature on rare/endangered, threatened and endemic plants of Odisha. The databases searched were Google Scholar, ResearchGate and Academia.edu etc. the keywords like threatened plants of Odisha, endemic plants in Odisha, traditional medicines of Odisha, traditional Uses of threatened plants of Odisha, conservation status of endemic and/or threatened plants were searched on the databases. Studies included in the review focuses on rare/endangered, threatened and endemic plants of Odisha, their traditional uses, phytochemistry, and pharmacology. Data was extracted from the selected studies in the form of information on the traditional uses of endemic threatened plants, their red list categories and distribution. The present review article aims to provide a comprehensive overview of the ret plants of Odisha, highlighting their traditional uses, phytochemistry, and pharmacology.

The over exploitation of plants for their medicinal purposes have lead to abuse of the rich biodiversity of the state. Deforestation and other anthropogenic activities have further aggravated the situation. Degradation of soil fertility, nutrition, moisture and biotic interference have resulted in the destruction of the RET species. Moreover, global rise in the demand of herbal drugs have increased the problem of proper utilisation, management and conservation of RET plant species.

Enumeration of RET plants

Systematic enumeration of rare and threatened plant species occurring in the region under study was conducted following Saxena & Brahman, 1995 & Rao *et al.*, 2019.

Cycas beddomei

Family: Cycadaceae

Common name: Beddome`s Cycas

Habitat: They grow in dry deciduous forests, bare quartzite rock and black sandy soils of open hill side at an elevation of 300-1000 mts.

Habit: Plants exhibit dioecious characteristics, with stems that remain subterranean for an initial period of 8 to 12 years; they emerge a few inches above ground level during the vegetative phase; cone-producing adults reach heights of 0.5 to 1 meters and have diameters of 30 to 60 cm, either existing singularly or in clusters formed by suckers originating from the underground stem; the phenomenon of suckering and clumping is particularly prevalent in male specimens, with each cluster comprising 3 to 10 (20) individuals; in contrast, females predominantly exist

as solitary entities with rare instances of clump formation. The stems are relatively short, predominantly concealed by the foliage crown, exhibit a cylindrical form, are uniformly thickened, and are typically unbranched, with dichotomous branching occurring infrequently. The underground stem is well-developed, characterized by a smooth, spindle-like morphology, attaining lengths of 30 to 60 cm and diameters of 15 to 25 cm in mature specimens. Petioles measure between 10 and 30 cm in length, exhibit an angled structure, and are densely covered with a brownish tomentum, which is partially spinous; in instances without spinous features, the length ranges from 10 to 15 cm, whereas those with spinous characteristics range from 3 to 12 cm; the basal leaflets progressively transform into spines; these spines typically number between 3 to 10 pairs and are not prominently visible; the leaflets are abundant; closely arranged along the rachis with an interleaf distance of 6 to 10 mm, they are highly linear in shape, with the base subtly enlarged on either side of the rachis to form a wing, exhibiting distinctly revolute margins, a narrowed apex that is sharply pointed, a midrib that is prominently raised on the upper surface and grooved on the lower surface, and mature leaflets that are recurved, firm, and exhibit a fibrous appearance. Cataphylls are produced annually, alternating with the foliage crown, arising prior to the emergence of pollen and seed cones in cone-producing adults, arranged spirally in 6 to 8 rows, characterized by a thick brown tomentose texture, shining, and triangular at the base, gradually tapering from above the base, measuring as long as the pollen cone stalk or slightly exceeding it, with lengths of 3 to 5 cm, and reflexed from the middle, culminating in a blunt apex. Pollens exhibit a golden orange hue that is bright, transitioning to a thick brown coloration upon maturity, with an ovoid or narrowly ovoid shape, rarely oblong, tapering at both ends and slightly swollen in the middle. Microsporophylls are characterized by thickened structures that are raised on both sides, tapering to a point; the fertile portion is significantly narrowed with a wide base; the sterile portion (apophysis) is triangular, typically entire but occasionally forked, covered in rusty brown tomentum, and detaching upon maturity, measuring between 2 and 2.5 centimetres in length, clearly winged or auricled at the sides, elevated in the centre, and progressively narrowing into a spine; the spine is slender, measuring 1.5 to 2 centimetres in length, interspersed at the middle; the central axis is slender. Seed cones are observed from April to February, being compact when in a juvenile state and becoming loose upon maturity beneath the foliage crown; megasporophylls number between 20 and 50, initially pale brown and woolly tomentose, transitioning to a silvery grey hue at maturity, and gradually shedding. Conservation status: Owing to its restricted population the species belongs to endangered list of the IUCN red data book.

Medicinal Uses: It is a critically endangered cycad endemic to Indian subcontinent. It has a rich history of medicinal benefits in local communities. Male cones serve as a primary ingredient to treat rheumatoid, arthritis and has rejuvenating properties. The paste produced from seeds and coconut oil are used as a poultice for treatment of sores, boils and wounds (Raju *et al.*, 2019).

Cycas nayagarhensis

Family: Cycadaceae

Common name: Aruguna and/or Oruguna (vernacular names) in Odisha

Habitat: They grow on exposed rocky sandstone hills at an elevation of 135 -185 mts.

Habit: Stem arborescent, branched or unbranched, up to 5 m tall, 50-92 cm diameter. Bark thick with alternate bands of persistent leaf bases and cataphylls when young and smooth in mature plants.

Leaves 1.04-2.10 m long with 80-176 pairs. Petiole spinescent, 28-47 cm long, spines 18-29 pairs. Pinnae lanceolate, margin entire and glabrous with prominent midrib. Median pinnae 19-28 cm long × 0.6-1 cm wide and attached to the rachis at 50-55°. Male cone large, ovoid, sub conical, 18-43 cm long, 10 20 cm in diameter, orange in colour. Microsporophylls 40-50 mm long, 20-25 mm wide, fertile zone 30-34 mm long, apical spine stout, upturned, 22-30 mm long, entire, rarely forked. Megasporophylls tomentose, 12-19 cm long, lamina 70-85 mm long, 28-37 mm wide, lanceolate, dorsiventral; 13 25 lateral spines on either side, lateral spine entire, 4-9 mm long, apical spine 3-4.6 cm long. Ovuliferous region 6-12 cm long Ovules 1-6, glabrous, laterally compressed, spheroidal to broadly ellipsoidal, 33-38 mm long, 35-39 mm in diameter, green when young, yellow at maturity, sarcotesta 4-5 cm thick, fibrous layer present, sclerotesta stony. Seeds platyspermic and germination cryptocotylor. Large trunk (50-92 cm in diam.), wider at base tapering apically, large ovoid male cones, occasionally forked sterile apex of the microsporophylls. These are the distinguishing characters of the plant.

Conservation status: Anthropogenic activities and over exploitation for religious purposes have led to decline in its population so much so that the species can be enlisted as critically endangered B2ab (iii, v) [IUCN Redlist Categories and Criteria (Ver. 9, 2011) (Singh *et al.*, . 2015)

Traditional Uses: Mosquito repellent is prepared from the male cone. Stem is used by locals for cultural and religious purpose (Singh *et al.*, 2015)

Cycas orixensis
Family: Cycadaceae
Common name: Aruguna
Habitat: They grow in the moist tropical deciduous forests where the habitat remains swampy and inundated during the monsoon season.

Habit: Plant arborescens; The trunk is characterized by its considerable height, reaching up to 6 m, with a slender diameter measuring between 12.5 and 32 cm. Typically, older specimens exhibit a generally unbranched morphology, frequently lacking a persistent protective layer of leaf bases. The photosynthetic foliage is pinnately compound, featuring 40 to 96 pairs of pinnae, extending 70 to 190 cm in length, exhibiting a dark green, glabrous texture, with the petiole presenting spines. The median pinnae are decurrently affixed to the adaxial surface of the rachis at an angle ranging from 40^{o} to 50^{o}. Upon examination in cross-section, the pinnae reveal 2 to 3 mucilage canals positioned towards the abaxial (phloem side) of the vascular bundle. The male cones are ovoid in shape, displaying a yellowish-orange coloration that transitions to an orangish-red hue at peak diurnal periods coinciding with anthesis or pollen dispersal, measuring between 11 to 21 cm in length and 10 to 12 cm in diameter. The microsporophylls are arranged in a spiral fashion and possess an obtrulloid lamina, with the sterile apex sharply upturned or inflected towards the ventral side, culminating in an apical spine measuring 22 to 38 mm in length; the spine may be either entire or forked, with forking typically being unequal, generally ranging from 1 to 3, however, numerous irregularly arranged protuberances and blunt spines have also been documented beneath the apical spines along the apophysis margins. The female cones are compact and spirally arranged during their juvenile stage, becoming lax at maturity. The megasporophylls are characterized by a tomentose texture, exhibiting an amber coloration, measuring 12 to 23 cm in length, with a dorsiventral, lanceolate lamina, ranging from 45 to 75 mm in length and 20 to 38 mm in width, possessing 12 to 20 lateral spines on either

side; these lateral spines may be either entire or occasionally forked, measuring 6 to 17 mm in length and 1 to 3 mm in width at the base, while the apical spine is spear-like, measuring 20 to 40 mm in length and 4 to 8 mm in width. The ovuliferous region spans 5 to 9 cm in length, containing 2 to 6 ovules that are glabrous, sessile, and orthotropous, attached laterally, exhibiting spheroidal to broadly ellipsoidal shapes, measuring 30 to 34 mm in length and 28 to 32 mm in diameter; following fertilization, the sarcotesta transitions from yellow to mango-yellow at the time of seed shedding, with a thickness of 2 to 4 mm, a fibrous layer present, while the sclerotesta is stony and the endotesta is membranous, devoid of spongy tissue. The seeds are classified as platyspermic. Germination occurs via cryptocotylar mechanisms. Distinguishing characters. –– Cycas orixensis can be differentiated from C. circinalis by its slender trunk (measuring 12.5 to 32 cm in diameter); the entire or variably forked nature of the apical spine of the microsporophylls; the characteristics of the sterile apex of the megasporophylls; and the size, shape, colour, and number of the ovules. Additionally, it is distinctly separated from C. sphaericaRoxb. by the presence of microsporophylls with one to multiple forked apical spines and the lanceolate lamina of megasporophylls featuring a long, prominent spinescent apex. (Singh *et al.*, 2015)

Conservation status:Cycas orixensis is classified as Critically Endangered as a result of significant recent reductions in the population of mature specimens. Continuous surveillance of various subpopulations has documented the severe depletion of a majority of the population within the known habitats by 2017, with only a limited number of remnant individuals identified in these subpopulations. Projected ongoing declines are anticipated to surpass 80% across three generations. (IUCN Red List 3.1)

Traditional Uses: Male
Cone is used as a pesticide. The leaves are consumed to cure gastro-intestinal disorders. Leaves and the shoot apex are preferred for various religious and traditional sacred practices. (Singh *et al.*, 2015).

Cycas sphaerica
Family: Cycadaceae
Common name: Spherical sago (Odasamari in local language)
Habitat: Grows in moist tropical deciduous forest and on bare surface of hills at an elevation of 300 to 1000mts.

Habit: Plant with arborescent stem, base not strongly swollen, bark thick with persistent leaf bases and having bright green, semi glossy, 150-270 cm long leaves. Spinescent petiole which are glabrous in nature,45-60 cm in length. Basal leaflets not gradually reducing to spines. Simple, weakly discolours, having flat margin, softly acuminate apex median leaflet. Soft, persistentnarrowly triangular cataphylls. Narrowly ovoid, orange, 45cm long, 10 cm in diameter. Microsporophyll with firm lamina, not dorsiventrally thick, apical spine prominent. Brown, tomentose megasporophyll, 2-5 ovules, with lanceolate lamina, apical and lateral spines. 25 mm sub- globose seed**.** (Reddy, 2006)

Conservation status: Loss in habitat, anthropogenic activities and illegal exploitation have diminished the population of these plant species. The current conservation status of this species in Endangered as per IUCN 3.1

Traditional Uses: *Cycas sphaerica* is one of the endemic and globally threatened species present in Odisha and Eastern Ghats. It serves various purposes traditionally to the locals as its leaves are a great aid in preparing bouquets. Its leaves also used as edible leafy vegetables. Seeds are grounded as flour and used in food.

Male cone emits a strong odour hence used as mosquito repellent (Raju *et al.*, 2019)

Heritiera fomes
Family: Malvaceae
Common name: Sunder/Sundri
Habitat: Found in the estuarine zone upstream of the high intertidal region. They prefer to grow in less saline area more in fresh water.

Habit: It is an evergreen medium sized tree, growing up to 25m in height. Whose bark is greyish brown, smooth; when cut red, laminated; twigs usually slender and terete, usually with prominent leaf scars. Leaves simple, spirally arranged, elliptic, ovate or semi-obovate, 8–17 x 3–7 cm apex acute to obtuse base slightly cuneate to obtuse coriaceous, glabrous, always glaucous on lower surface; margin entire, nerves faint. Leaves are grouped toward the ends of the branches. Petiole up to 2 cm long. Inflorescence a lax panicle, up to 7 cm long, axillary or in upper leaf scars. Sepals 5, campanulate, green or yellowish, 3–4 mm long, divided one-third of length, hairy on both surfaces. Stamens 8–10, sessile, on top of an even slender column, around a sterile ovary in male flowers. The stamens fused together to form a cylindrical dumbbell known as pistilloid. Ovary in female flowers with ellipsoid locules, each with one ovule. Fruit ellipsoid or globular, ca 2 x 1 cm, with a longitudinal ridge, glabrous; epicarp dull. Fruits are light green and become brown with ripening. They are single seeded with fleshy endosperm. Seed size varies between 3–5.5cm long and 3.5–5cm wide. Seed shedding occurs during June and July. At the age of three years, the species begin to produce pneumatophores. The height of the pneumatophoresisabout 50cm.H. fomes istheonlyHeritiera species which produces pneumatophores. Pneumatophores are one type of excessively branched roots that are negatively geotropic and come out of the mud surface to access the atmospheric oxygen. The sapwood is pinkish grey and heartwood dark to radish dark brown. Wood is hard, heavy, and durable (Mahmud *et al.*, 2014).

Conservation status: IUCN has assigned this plant species as endangered. Although they are comparatively common in some places yet encroachment of land due to rice farming, fish farming, etc pose a threat to this species.

Traditional Uses: Decoction prepared together by the mixture of leaves and seed is used in disease like diarrhoea and dysentery. Paste made up of stem bark of this plant is used as a cure of skin diseases. Wood is very durable hance used by the coastal people for house and boat making and also in furniture. It's also a good source to make charcoal (Mahmud *et al.*, 2014).

Leaf extracts containglycosides which acts as anti-bacterial, anti-inflammatory and anti-fungal agent. It is also reported to have antioxidant properties. Alkaloids present in its leaves find various applications like Ephedrine is used in bronchial asthma, Atropine which is also an alkaloid is administrated to diagnosis of bradycardia. Morphine is now one of the recognized alkaloids, a potent narcotic which is used to relieve pain (Das, 2020.).

Mesua ferrea:
Family: Calophyllaceae
Common name: Ceylon ironwood or cobra saffron (Nageswar or Nagkesar in local vernacular language)

Habitat: Found in evergreen forests particularly in river valleys at an elevation of 1000 to 1500 mts**.**

Habit: It represents a moderately sized or comparatively large evergreen arboreal specimen, attaining heights of up to 36 meters. The trunk is characterized by a cylindrical to irregular morphology, reaching diameters of up to 95 centimetres, frequently exhibiting fluting at its base. The surface of the bark is either smooth or adherent-scaly, occasionally

presenting a somewhat dimpled texture, with an ochrous-brown hue that reveals a vibrant orange layer beneath. The leaves are arranged oppositely, exhibiting a simple and entire structure, typically elliptical to narrowly elliptical in shape, and are either glabrous or occasionally glaucous. The leaves exhibit a glossy appearance, characterized by numerous secondary veins that loop and run nearly parallel to the margin, often accompanied by equally prominent reticulating tertiary veins. There are instances of more or less persistent stipule-like interpetiolar modified leaves. The flowers are terminal or axillary, bisexual in nature, occurring solitarily or arranged in an open panicle of up to nine flowers, with the pedicel featuring small paired bracts. The sepals consist of four decussate, suborbicular structures that are persistent and variably enlarged and thickened in the fruiting stage. The petals are four in number, presenting either white or pink coloration. The stamens are numerous, either free or connate solely at the base, with the ovary being superior (1-2 celled), each cell containing 1-2 axillary ovules. The style is slender, culminating in a peltate to four-lobed stigma. The fruit takes the form of a capsule, generally globose, often with a beaked structure, exhibiting a thin woody consistency, and typically dehiscing with two to four valves prior to abscission, frequently secreting resinous droplets. Each fruit encompasses one to four seeds. (Shome *et al.*, . 1982)

Conservation status: The species is assessed as Vulnerable by IUCN3.1.The total population size is approximated to encompass approximately 36,900 mature individuals. The species has been harvested for its timber since the era of colonialism, and the selective harvesting of its wood has persisted into the current century. It is predominantly impacted by the extensive clear-cutting of substantial areas of rainforest throughout its distribution range, resulting in declines in the number of mature individuals, the quality of habitat, the extent of occupancy, and the number of distinct locations. It is postulated that the population size has experienced a reduction of 40% over the last three generations, and the factors contributing to this decline are deemed irreversible. (IUCN Red List3.1)

Traditional Uses: This globally threatened tree, known for its beautiful flowers and hard wood, has been utilized for centuries in traditional medicine systems like Ayurveda. Different parts of the *Mesua ferrea*known as Nageswar or Nagkesar tree, including its flowers, leaves, bark, and seeds bearing a range of phytochemicals, have been employed to address a wide range of ailments, put forwarding its multipurpose ethnobotanical value. *Mesua ferrea*Dried leaves when mixed with gheeact as a cure for Burning sensation (Arora *et al.*, 2019**)** Its bark is used in treating cough and sore throat. Seed oil poses disinfectant properties (Chahar *et al.*, 2013)

Pterocarpus marsupium
Family: Fabaceae
Common name: Indian Kino tree (Piasal)
Habitat: Grows in dry and moist deciduous forest. They also grow on exposed hill slopes at an elevation of 750 to 1400 mts.

Habit: P. marsupium tree is a medium to large, deciduous tree which can grow up to 30 meters in height (Anon). It bears c leaves large green coloured, compound, 3-7 inches length, 5-8 leaflets, margin curly and thick. From leaflet to leaflet, the petioles are round, flat, undulated and long up to 5 or 6 inches and not having stipules, which have three to seven oblong leaflets, P. marsupium' fragrant yellow flowers occur in large panicles. Its seed pods are orbicular, flat and winged. The bark of the *P. marsupium* tree is rough, grey, longitudinally fissured and scaly. Older trees exude a blood-red gum resin. The tree's heartwood is golden yellow, while its sapwood is pale yellow to white in colour (Badkhane *et al.*, 2010). Its stem

bark is of grey brown colour. Bark products are reddish gum. 19-20 Different parts of *P. marsupium* are shown in flowers are 1.5 cm long, white with a minor yellow tinge with 10 stamens. Anthers are 2 lobed.19 Pods are brown, glabrous, flat, orbicular, winged like, 3-6 cm in width, usually single seeded and curved convexly. There are almost 1500-2000 pods/kg.21 Seeds are kidney shaped 1 to 1.3 centimetre (Rahman *et al.,* 2018).

Conservation status: Vulnerable (IUCN 3.1)

Medicinal Uses: Leaves and steam exudates (kinno) of *Pterocarpus marsupium* skin disease and diarrhoea respectively (Devgun *et al.,* 2009) It has been traditionally used in the treatment of leukoderma, elephantiasis, diarrhoea, cough, discoloration of hair and rectalgia. It is nontoxic and useful in jaundice, fever, wounds, diabetes, stomach-ache and ulcer. Decoction prepared from its bark is used by pregnant women during pregnancy for pain relief. A nucleoside derivative Furan-2-one,3,4-dihydroxy-5-[1-hydroxy 2-fluoroethyl] is anti-viral in nature. Benzoic acid, 2,6-bis[(trimethylsilyl)oxy]- trimethylsilyl ester a phenol provides antifungal property. Steroids like. 1-Monolinoleoylglyceroltrimethylsilyl ether and Ethyl iso-allocholate provides Anti-microbial, anti-oxidant, anti-inflammatory, anti-arthritic, anti-asthma, Diuretic and anti-cancer properties (Hugar *et al.,* 2017).

Pterocarpus santalinus

Family: Fabaceae

Common name: Red sandalwood

Habitat: Dry deciduous forest

Habit: It is classified within the Fabaceae family, represents a small to medium-sized deciduous tree characterized by an exceptionally dense, dark purple heartwood that possesses a bitter taste **(**Indika *et al.,* 2011**).** The bark exhibits a blackish-brown hue, measuring 1-1.5 cm in thickness and is deeply fissured into rectangular plates due to pronounced vertical and horizontal separations. The blaze is pale yellow, adorned with numerous pink streaks and secreting a copious amount of thick, red, sticky gum. The branchlets exhibit a drooping growth habit and are devoid of hairs. The leaves are trifoliate, ranging from 10 to 18 cm in length, with the rachis exhibiting a swollen base. Typically, three leaflets are present (although more than three may occur rarely), which are broadly egg-shaped or orbicular in form. The base of the leaflets is either rounded or slightly heart-shaped, while the apex is also rounded or exhibits a deep notch. The leaf margins are entire, leathery, lustrous, hairless, and distinctly stalked. The flowers are hermaphroditic, borne on stalks in axillary simple or sparingly branched racemes, presenting a yellow coloration, measuring approximately 2 cm in length, and are fragrant. The pods are asymmetrically orbicular, flat, measuring about 5×4.5 cm inclusive of the wing, and taper gradually into a short tip approximately 1 cm in length. The seeds, numbering one or rarely two, are more or less kidney-shaped, measuring 1-1.5 cm in length, smooth, and exhibit a reddish-brown coloration. (Azamthulla *et al.,* 2015).

Conservation status: Endangered (IUCN Red List 3.1)

Traditional Uses: Red Sandalwood, holds a significant importance in traditional practices, particularly in India and East Asia. Valued for its red shade and unique properties, the wood has been used for centuries in various cultural and artistic applications. In India, it's used in various sacred rituals. Red Sandalwood also plays a role in traditional medicine systems, where it's believed to possess therapeutic properties. *Pterocarpus santalinus* Heartwood when rubbed with honey and ghee work as a cure of different Vision defects (Azamthulla *et al.,* 2015). Paste of its heartwood is used against inflammation and skin eruptions.

Saraca asoca
Family: Fabaceae
Common name: Ashoka
Habitat: It is native to India and Sri Lanka. Commonly present in semi evergreen forest and tropical moist deciduous forests. Found near streams and rivers. It is a Medium Height tree

Habit: A tree ranging from 6 to 9 meters in height; the branches exhibit a glabrous surface. The stems are either erect or ascending, exceeding 2 meters in height, robust, glabrous, or exhibiting a sporadic degree of glabration. The leaves measure between 15 and 25 cm in length; the rhachis is glabrous and corky at its base; the petioles are notably short; the stipules are intrapetiolar, completely fused, measuring 10-13 by 6 mm, and are scarious, ovate, oblong, obtuse, and parallel-nerved. The leaflets are presented in 4-6 pairs, measuring 10-20 by 3-5.7 cm, oblong-lanceolate in shape, either obtuse or acute, predominantly glabrous, with a base that is rounded or cuneate and slightly oblique; the petiolules are 4.5-6.5 mm long, robust, and wrinkled; the stipels are deciduous (Pradhan *et al.,* 2009). The bark is characterized by a brown, grey, or nearly black coloration, exhibiting a warty texture. The stem bark is rough and uneven, attributable to the presence of rounded or projecting lenticels. The bark displays a channeled, smooth surface with circular lenticels and transverse ridges, occasionally exhibiting cracks. The fracture reveals a striated surface, with a thin, whitish, and continuous layer observable beneath the cork layer. The flowers are actinomorphic or exhibit slight irregularities, are fragrant, and are numerous, occurring in dense axillary corymbs measuring 7.5-10 cm across; the peduncels are robust; the pedicels range from 8-13 mm in length, are red, and glabrous; the bracts are ovate and subacute; there are two bracteoles that resemble a calyx and measure 4 mm in length, spathulate-oblong, subacute, ciliolate, amplexicaul, and colored. The calyx transitions from yellow to orange and ultimately to red; the tube measures 1.3-2 cm in length. Petals are absent. The stamens number 7 or 8 and are markedly exerted; the filaments are filiform and measure three times the length of the calyx segments; the anthers are purple. The ovary is pubescent, particularly along the sutures; the style is curved into a ring. The pods are black, measuring 10-25 by 4.5-5 cm, linear-oblong, tapering at both ends, compressed, glabrous, and veined, with seeds numbering 4-8, ellipsoid-oblong, measuring 3.8 cm in length, and slightly compressed (Borokar *et al.,* 2017).

Conservation status: Vulnerable
Traditional Uses: *Saraca asoca* has been revered for its medicinal properties for centuries. It contains a plethora of bioactive compounds with potent therapeutic effects. Ashoka is traditionally used to treat a wide range of diseases. Bark of this plant when prepared as a decoction with milk is treated against various gynaecological problems. Bark of Ashoka when prepared with honey works as a cure to uterine bleeding. (Pradhan *et al.,* 2009)

Themeda Saxicola
Family: Poaceae
Habitat: The species grows in patches of shallow soil and in rocky crevices on granite gneiss it completes flowering and fruiting by December, before the start of the dry season. It grows in seasonally dry tropical biomes, often on rocky outcrops

Habit: This perennial plant grows up to 35 cm tall and has slender stems that emerge from a woody base. Its simple flower structure consists of a single raceme at the top of each stem, containing nine spikelets arranged in a specific pattern (four involucral, a pair, and a triad). The outer spikelets (involucral) are 11–15 mm long and smooth, while the fertile spikelets are smaller (7.5-8 mm) and densely covered with stiff hairs. Long, bent bristles (awns), up to 3 cm long, are always present. This species is easily identified

within its genus by its unique characteristic of having solitary racemes at the end of each stem.

Conservation status: It is assessed as critically endangered species by IUCN Red List 3.1.
Traditional use: *Themeda saxicola* is used for food by indigenous people of the state of Odisha (Clayton *et al.,* 2006).

Conclusion

The utilization of plants for human benefit is a huge reflection of the ethnicity of the local population and their beliefs. This also reveals the nature of plant of that area and the disease epidemiology. The biochemical constituent of the plant plays a major role for their selection as a substitute to regular allopathic medicines. The indigenous community using these plant sources are often negligent about the physical and/or chemical properties of the plants. However, unrestricted exploitation of these plants and their parts has pushed them on the verge of being extinct from the surface of Earth. This review highlights some of the selected endemic plant species from Odisha which belong to the threatened category as per IUCN red data book. It is time that conservation strategies should be adopted to facilitate sustainable conservation of these medicinally significant plant species.

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